

Green Data Centers

GOING FORWARD ENERGY
EFFICIENCY TRENDS

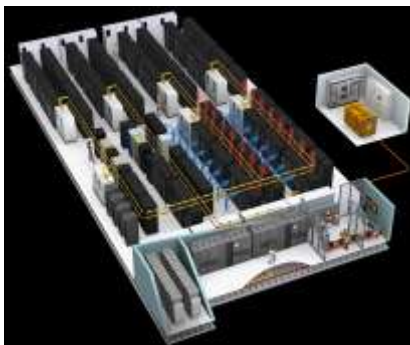
André ROUYER
Director of Standardization & Environment

All content in this presentation is protected – © 2008 American Power Conversion Corporation



Energy Efficiency Data Centers

- Global Challenges
- The new European Code of Conduct on Data Centers
- The Green Grid metrics on measuring Energy Efficiency
- The importance of standardization
- The next challenges to improve Energy Efficiency

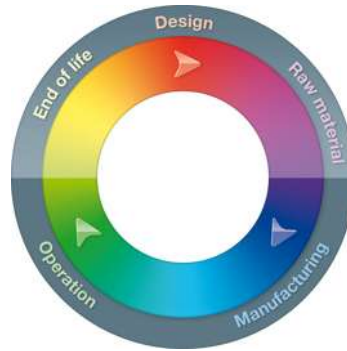


APC by Schneider Electric – ELECTRA – March, 2009



Energy Efficiency Data Centers

- Addressing the complete life cycle
- From the “cradle to the cradle”
 - Eco-design
 - Use “ Operation
 - Disposal
 - Recycling



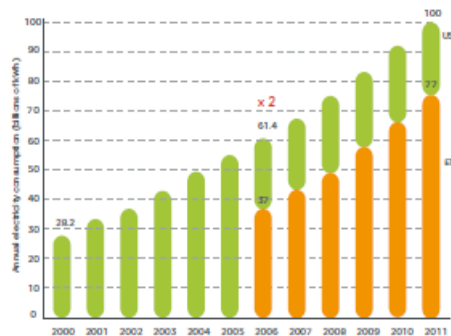
More than 90% of the Energy is consumed during the operation of the Data Center

APC by Schneider Electric – ELECTRA – March, 2009



Energy Efficiency Data Centers

- 20% reduction target for energy consumption and CO2 emissions in Europe by 2020
- Mainly generated by electrical power plants
- Data Center consumption of Electricity rising faster than other industries
- In 2008 Data Centers in the 27 countries of E.U consumed 56 Twh i.e 1.5% of total electricity
- 10 to 15% annual growth and will likely double in 5 years.



APC by Schneider Electric – ELECTRA – March, 2009



Data Centres A growing Energy demand

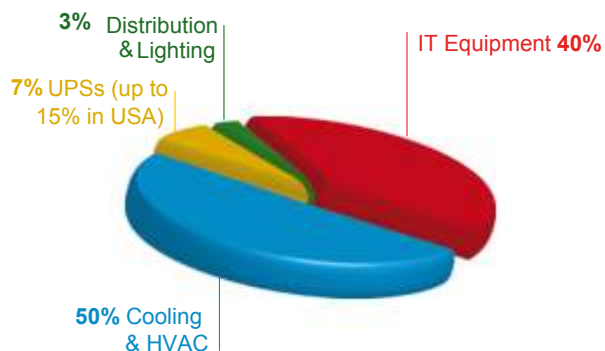
- Continuing and growing needs for IT SERVICES
- Rising Data Centre electricity consumption projected
 - Western Europe: 56 TWh in 2007, rising to 104 TWh in 2020
- Expected to contribute substantially to the European Union commercial sector
- Maximise Energy Efficiency of Data Centres to make sure the carbon emissions and energy consumption are mitigated
- Involving global Hi Tech companies caring about the future of the planet

APC by Schneider Electric – ELECTRA – March, 2009



Energy Efficiency Data Centers

How Energy is Distributed



Typical Power Consumption in Data Centers

In the years to come 50% of Data Center costs will consist of energy

APC by Schneider Electric – ELECTRA – March, 2009

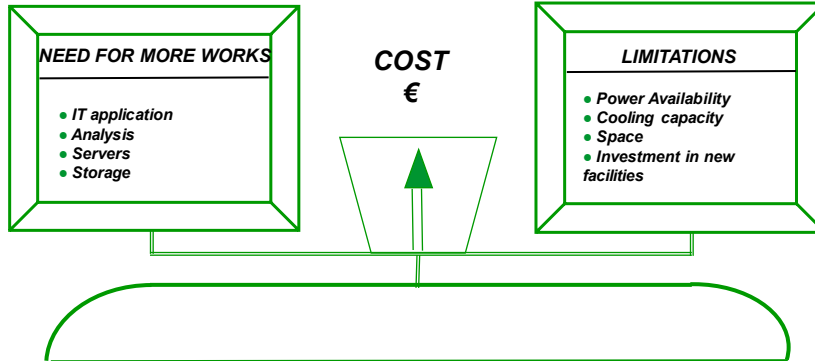


Energy Efficiency Data Centers

TODAY'S CHALLENGE



CHALLENGE BETWEEN:



APC by Schneider Electric – ELECTRA – March, 2009



Energy Efficiency Data Centers



INITIATIVES ON E.E ARE RISING

- In the US, Europe and ASIA
- Within the frame of commercial consortium (The Green Grid, AFCOM, DCD,...)
- But also with standardization bodies (IEC, CENELEC,...)
- And with governments (DoE, EPA, JRC/CoC)

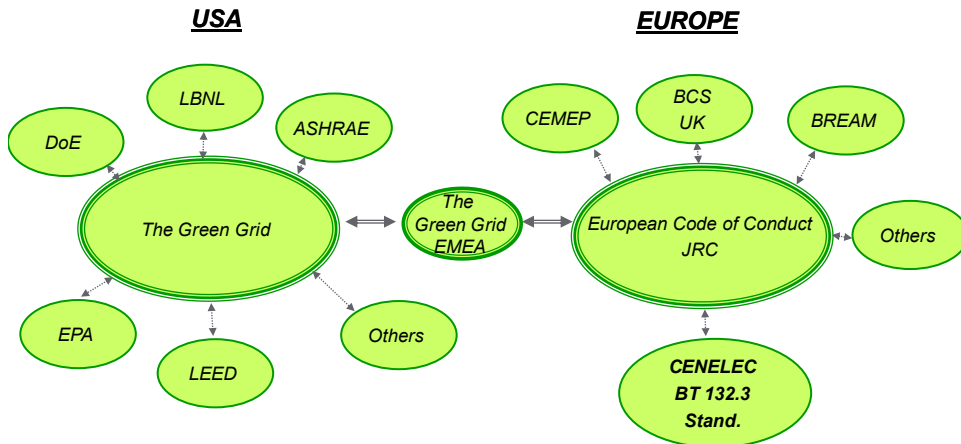
AND MANY OTHERS TO COME

APC by Schneider Electric – ELECTRA – March, 2009



Energy Efficiency Data Centers

MAPPING ON CURRENT STAKEHOLDER IN USA AND EUROPE



APC by Schneider Electric – ELECTRA – March, 2009



EU Data Centres Code Of Conduct

- Led by European Commission Joint Research Centre
- Set ambitious voluntary standards and commitments
- Lays ground which are used by other European policies
- Tailored to European conditions such as the climate and energy markets regulation



The new Code of Conduct provides a platform to bring together European stakeholders to discuss and agree voluntary actions with the goal to improve Energy Efficiency

APC by Schneider Electric – ELECTRA – March, 2009



EU Data Centres Code of Conduct

Scope

- **The CoC Covers**

- “Data Centres” of all sizes servers rooms to dedicated buildings both existing and new
- IT power and Facility power
- For participants (DC owners and operators) and Endorsers (vendors, consultants, industry associations)

- **With the aims:**

- To raise awareness among stakeholders on the opportunity to improve E.E
- To provide an on-going forum for discussion
- To create and provide tools to implement cost-effective energy saving
- To develop easy metrics to measure efficiencies and improvement
- To harmonise with other international initiatives
- To support procurement for eco-citizen equipment
- To set efficiency targets for DC owners and operators

APC by Schneider Electric – ELECTRA – March, 2009



EU Data Centres Code of Conduct

Start measuring to improve



- Initial energy measurement and energy assessment to identify major saving opportunities
- Energy consumption must be monitored regularly
- Participants benchmark their DC efficiency overtime using the Code of Conduct metric based on The Green Grid metrics and measurements

APC by Schneider Electric – ELECTRA – March, 2009



The Green Grid metrics and measurements on Energy Efficiency

DATA CENTRE INFRASTRUCTURE EFFICIENCY (DCIE)

• TGG

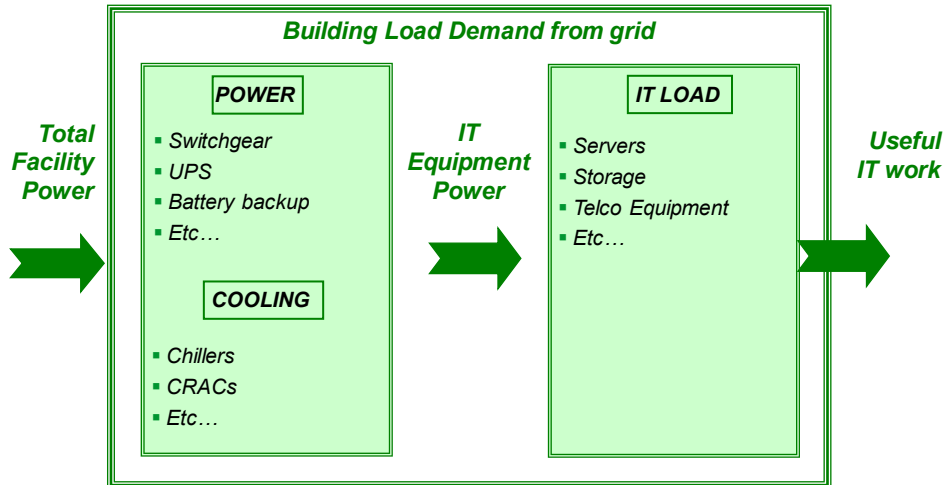


- An association of 200 IT professionals
- Seeking to dramatically raise the E.E of Data Centres
- Through a series of short demands long term proposals
- Proposing the use of data Centre Infrastructure Efficiency (DCIE)
- Participating to the E.E Code of Conduct development with the aim of a global harmonisation

APC by Schneider Electric – ELECTRA – March, 2009



The Green Grid DCIE

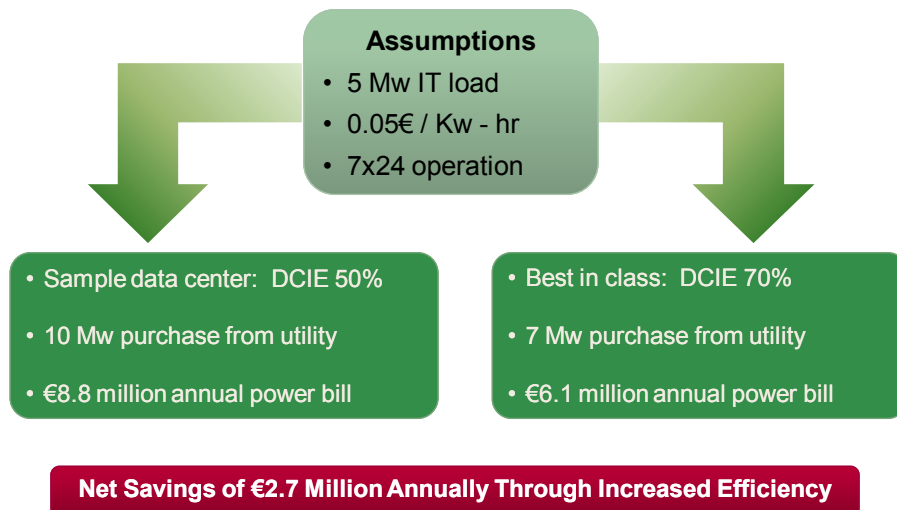


$$DCIE = \frac{IT\ Equipment\ Power}{Total\ Facility\ Power} \times 100$$

APC by Schneider Electric – ELECTRA – March, 2009



Sample Data Center: DCI Impact



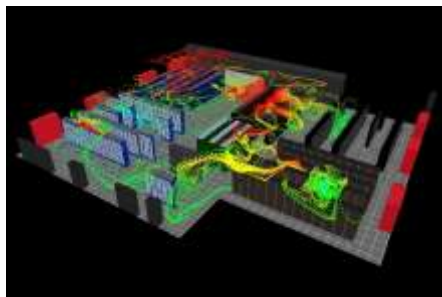
APC by Schneider Electric – ELECTRA – March, 2009



Improving Your PUE/DCiE Score



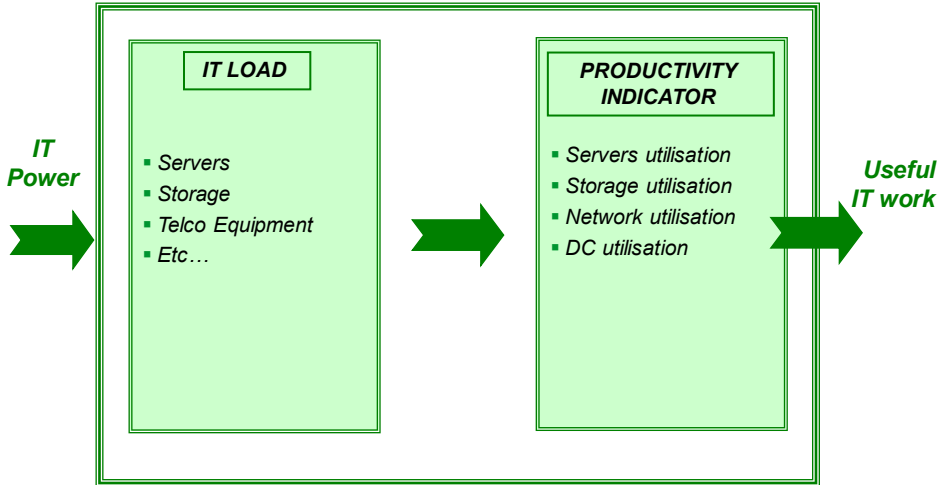
1. Develop an air management strategy
2. Move cooling closer to the load
3. Operate at a higher delta-T
4. Install economizers
5. Utilize higher specification and performance equipment
6. Utilize dynamic controls
7. Review your IT infrastructure



APC by Schneider Electric – ELECTRA – March, 2009



Data Centres Energy Efficiency Next steps



APC by Schneider Electric – ELECTRA – March, 2009

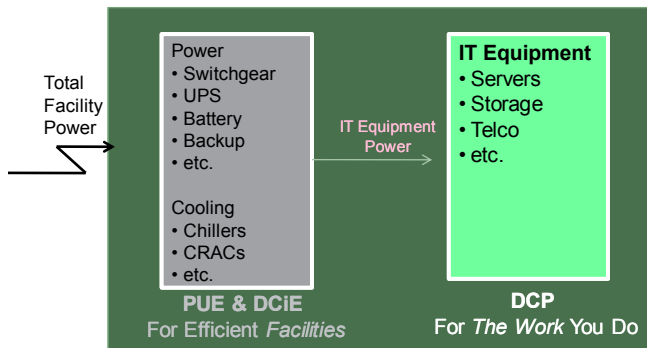


DCP: Under Development



$$\text{DCP} = \frac{\text{Useful Work}}{\text{Total Facility Power}}$$

How Much Work Can My IT Equipment Do, In My Facility?



APC by Schneider Electric – ELECTRA – March, 2009



Data Center Productivity



What is Data Center Productivity (DCP) ?

- Methodology of any resource that it consumes to produce this work for quantifying the useful work that a data center produces relative to the quantity of any resource that it consumes to produce this work
- Mathematically expressed:

$$\text{DCP} = \frac{\text{Useful work produced by Data Center}}{\text{Resource Consumed Producing the Work}}$$

- Useful work is defined as completed tasks that have value to the end user or business supported by the Data Center

APC by Schneider Electric – ELECTRA – March, 2009



Productivity Indicator



- DCiE and PUE have received industry mindshare for determining how efficiently power and cooling is used of PUE and DCiE metrics
 - Work is going on further development of PUE and DCiE metrics
- In order to allow Data Centers to estimate their productivity as a function of power used, The Green Grid recommends
 - Tracking similar indicators such as:
 - DCiE, “data center infrastructure efficiency”
 - ^Userver, “server utilization”
 - UDC, “data center utilization”
 - ^Ustorage, “storage utilization”
 - ^Unetwork, “network utilization”
 - Creating a visualization tool to allow quick assessments and comparison to internal and industry norms.

APC by Schneider Electric – ELECTRA – March, 2009



Productivity Indicator



	Theoretical	Target	Peak	Average
DCIE	100	90	55	50
Server Utilization	100	80	45	15
DC Utilization	100	91	50	45
Network Utilization	100	80	30	10
Storage Utilization	100	70	40	35

Indicators have values of 0 to 100 percent, where:

- > 100 percent is the theoretical maximum
- > the target is the goal or maximum value that the business believes is achievable
- > the peak is the maximum achieved by the indicator during the period of monitoring
- > the average is the average value of the indicator during the period of monitoring

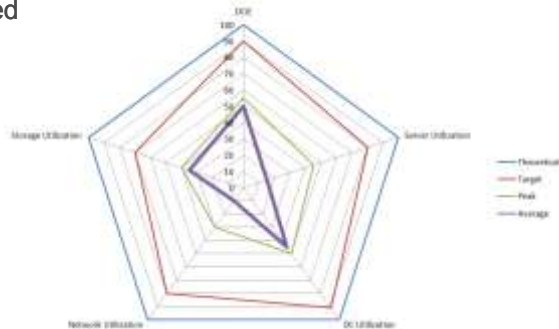
APC by Schneider Electric – ELECTRA – March, 2009



Productivity Indicator



- The Green Grid recommends these indicators be plotted on a radial graph
- Tool allows a quick view for the data center to assess how well they are using their resources
- If all the targets are met, all of the resources in the data center would be maximized



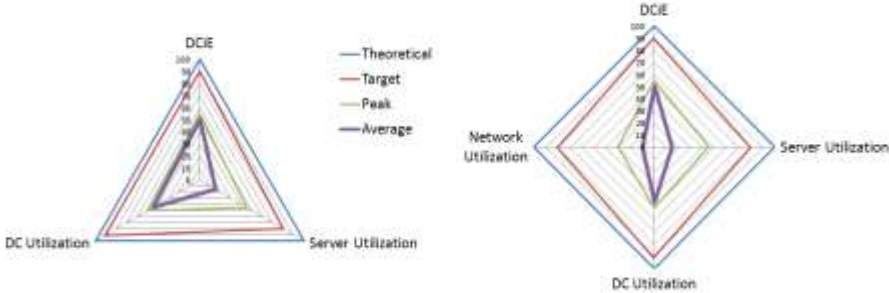
APC by Schneider Electric – ELECTRA – March, 2009



Productivity Indicator



- It is understood that end users may not have all of the data available to represent the five legs of the graph



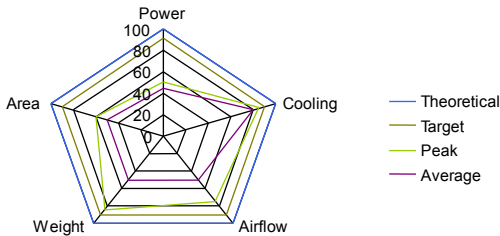
APC by Schneider Electric – ELECTRA – March, 2009



Productivity Indicator



- The same type of analysis can be performed at the next level down in order to give an in-depth look at the limitation and overall utilization of each axis topic, such as data center utilization



APC by Schneider Electric – ELECTRA – March, 2009



Energy Efficiency Data Centers

Start measuring to improve
Need to measure imply need to standardize

- Define terminology, performances, measurement and test methods
- Align and coordinate all standardization activities
- Propose an integral and ethical approach in standardization regarding the design and operation of Data Centers
- Design checklists and guides
- State of the art knowledge formalized by recognized experts through double level of consensus amongst stakeholders and across countries

APC by Schneider Electric – ELECTRA – March, 2009



Energy Efficiency Data Centers



But also standards can help to

- Promote good energy management practices
- Support harmonization of public policies
- Avoid technical barriers to trade related to energy policies
- Favor the creation of world markets for energy efficient technologies
- Help to improve consumers and end users understanding and confidence



***SET UP OF BT 132-3 GREEN DATA CENTERS TO
PROPOSE ACTIONS TO CENELEC***

APC by Schneider Electric – ELECTRA – March, 2009



Data Centres Energy Efficiency Next challenges



- Provide carbon footprint and address Energy Efficiency for embedded products for the whole life cycle and show the GREEN conscientiousness

- Substances (ROHS, REACH)
- Eco Design
- End of life



- Rank IT and Data Centres according to an Eco program

- Develop standardization works at the ISO, IEC, ITU or CENELEC to harmonize measurements



APC by Schneider Electric – ELECTRA – March, 2009